REMARKS

Rejection of Claims and Traversal Thereof

In the September 21, 2004 Office Action:

claims 1–15 were rejected under 35 U.S.C. §103(a) as being unpatentable over Michels (DE 4437149 A1).

This rejection is traversed and reconsideration of the patentability of the pending claims is requested in light of the following remarks.

Rejection under 35 U.S.C. §103(a)

Claims 1-15 were rejected under 35 U.S.C. §103(a) as being unpatentable over Michels. Applicants submit that Michels does not render applicants' claimed invention *prima facie* obvious.

Claim 1 is illustrative of the present invention.

> 1. A method for the continuous production of an extrusion solution for the formation of cellulosic molded bodies, such as fibers and films, according to the lyocell method, comprising:
>
> > (a) forming a cellulose suspension comprising cellulose pulp and an aqueous phase in a mass ratio in the range from 1:3 to 1:40 and shearing the cellulose suspension in a first shear zone for a period of time in the range from 5 to 200 minutes, wherein the cellulose suspension further comprises cellulose fine fibers and soluble impurities;
> >
> > (b) dewatering the cellulose suspension to form a damp cellulose material with a cellulose content in the range from 20 to 80 mass-percent, wherein a portion of the aqueous phase from the dewatering is discarded and a portion is recycled for subsequent use in step (a), thereby removing at least a portion of soluble impurities from the aqueous phase while recycling at least a portion of the fine cellulose fibers,

(c) conveying the damp cellulose material through a second shear zone in the absence of N-methylmorpholine-N-oxide, wherein the damp cellulose material is homogenized in the second shear zone, and wherein the solubility of the damp cellulose material is increased;

(d) adding a sufficient amount of aqueous N-methylmorpholine-N-oxide to the homogenized damp cellulose material to form a cellulose suspension with a content of N-methylmorpholine-N-oxide in the liquid phase in a range from 70 to 80 mass-percent and conveying the homogenized suspension through a third shear zone with the cellulose material essentially completely filling up the available conveyor cross-section in the shear zones; and

(e) converting the cellulose suspension in aqueous N-methylmorpholine-N-oxide into the extrusion solution by evaporating water evaporation with shearing in a fourth shear zone thereby reducing localized overheating and damage to the extrusion solution.

Thus, claim 1 includes the following steps:

1) a cellulose suspension in an aqueous solution is mixed and solubilized in a **first** shearing zone;

2) excess aqueous phase is removed from the cellulose, a portion of removed fluid is recycled, and another portion is discarded thereby recycling a portion of the fine fibers while removing from the system a portion of soluble impurities;

3) the cellulose suspension is introduced into a **second** shear zone to further increase the solubility of the suspension;

4) the cellulose suspension is moved into a **third** shear zone wherein it is mixed with N-methylmorpholine-N-oxide; and

5) water evaporation occurs in a **fourth** shearing zone, wherein the water is evaporated and the continuous shearing reduces any possible hot zone that would damage the final cellulose material before extrusion.

Thus, the cellulose is solubilized before it is mixed with the N-methylmorpholine-N-oxide. Further, by recycling some of the excess aqueous phase, fine cellulosic fibers are saved and recycled. Importantly, at least a portion of soluble impurities is removed from the aqueous phase thereby reducing any build up of impurities. Most importantly, the NMMO liquid phase can be recycled while reducing the level of impurities in the NMMO solvent.

In contrast, Michels describes a method that includes:

1) enzymatically pretreating cellulose, optionally in a shear zone

2) separating the pretreated cellulose from the bath, wherein all of the enzyme bath is recycled for reuse in step (1);

3) dissolving the pretreated cellulose directly into a melt of N-methylmorpholine-N-oxide under shearing conditions.

4) degassing with simultaneous water removal.

According to the Office:

> "It would have been obvious to one having ordinary skill in the art at the time the invention was made to include an additional step of shearing the cellulose before the addition of NMMO, because homogenizing a mixture prior to adding a component such as NMMO is known in the art. This allows the NMMO to be more effectively mixed."

Applicants vigorously disagree and submit that the cited reference does not describe, teach or suggest all the claim limitations recited in applicants' claimed invention.

Initially it should be noted that Michels does not teach or suggest a method or a system for removing and reducing the content of soluble impurities in the aqueous phase. According to the Michels' method, all of the aqueous phase separated during the dewatering process, which includes the enzymes, is recycled and reused thereby reducing the cost of enzyme replenishment.

In contrast, applicants discard a portion of the aqueous phase from step (b) and recycle a portion back to the mixing tank. Thus, for the production of the cellulose suspension in step (a), a portion of the aqueous phase is recycled from the dewatering of step (b) and fresh water is added thereto. Importantly, the remaining portion from the dewatering step (b) is discarded which reduces the amount of impurities in the aqueous phase.

It is incumbent on the Office to provide some suggestion or teaching in the prior art that would lead one skilled in the art to proceed in the direction of applicants' claimed invention. Applicants respectfully submit that the Office has not provided any objective or specific teachings or suggestions in the cited prior art to motivate one skilled in the art to modify the Michels reference. What is the asserted motivation put forth in Michels to recycle only a portion of the excess fluid from the dewatering step to reduce contamination of the aqueous phase with soluble impurities? Further, where is the motivation in Michels to provide an extra shearing step

before introduction of the NMMO to increase the solubility of the cellulose suspension before mixing with the NMMO? Clearly, there is none. The Courts have addressed this issue numerous times in a wide variety of factual circumstances and have stated that "[t]he mere fact that the prior art could be so modified would not have made the modification obvious unless the prior art suggested the desirability of the modification." *In re Mills*, 16 U.S.P.Q.2d 1430 (Fed. Cir. 1990). Thus, this allegedly "obvious" direction is supported only by the Office's reinterpretation of the art in light of applicant's disclosure.

Applicants submit that the Office failed to give weight to the advantages of the present invention as part of the "invention as a whole" and cited a reference that does not disclose or teach such advantages including the fact that the present invention recycles at least a portion of the fine fibres while reducing the impurities in the aqueous phase of step (a). Instead, the Michels system completely recycles the enzymatic fluid and there in no incentive in the Michels reference to discard any of the enzymatic fluid because of the cost of the enzymes. Clearly, Michels does not deal with the problem of the impurities and in fact never even recognizes that in the process of recycling all of the enzymatic fluid, the soluble impurities accumulate and as such are incorporated into the cellulose suspension, which is detrimental to the extruded fibers.

Another advantage of the present invention, not described or suggested by the cited reference, includes an additional shearing step after the dewatering process but before mixing the damp cellulose suspension with NMMO. This additional shearing step provides several benefits not disclosed by Michels. By performing step (c) a further activating of the cellulose suspension is achieved and forming an improved solubility before mixing with the NMMO in the third shearing zone.

Further, the present method provides for forming the extrusion solution in step (e) by predominately mechanical energy through a fourth shearing zone, which could not proceed with out the shearing process of step (c) which importantly, leads to a reduced thermal stress for the cellulose solution in step (e) and a reduced consumption of thermal energy. In contrast, Michels teaches the formation of an extruding solution at temperatures of 85°C, which is necessary to form the solution in sufficient time, but obviously causes thermal stress in the NMMO and cellulose solution.

Applicants have clearly provided in the instant specification a method and system that exhibit unexpected and surprising results. Just by reviewing the examples set forth in the present application and comparing applicants' results with that of Michels, it is evident that applicants' process and system is unexpectedly more efficient and approximately 18 times faster. For example, in applicants' Example 1, 270 Kg/h was processed with a cellulosic content of 12.3 %. In contrast, in Examples 8 and 9 of Michels only 250g/min which is the equivalent of 15-kg/ hour was processed with a cellulose content of 10% and 12%, respectively.

Thus, applicants' specification contains specific data indicating surprising and unexpected results. According to the Court in *In re Soni*, 34 U.S.P.Q.2d 1684 (Fed. Cir. 1995) all evidence of nonobviousness must be considered when assessing patentability, and the PTO must consider comparative data in the specification in determining whether the claimed invention provides unexpected results. The basic principal behind this rule is straightforward — that which would have been surprising to a person of ordinary skill in a particular art would not have been obvious. The principal applies most often to the less predictable fields, such as chemistry, where minor changes in a product or process may yield substantially different results. Clearly, an increase in production, at the level of 18 times greater is unexpected, and as such, the Michels reference does not render the presently claimed invention obvious.

As stated above, the Office believes that it is known in the art or the Michels reference provides incentive to provide for shearing of the cellulose solution before introduction of the NMMO. However, after a very thorough review of the Michels reference, applicants found absolutely no discussion of subjecting a damp cellulose suspension to shearing before introduction of the NMMO. Instead, the only discussion in Michels, relates to using shearing or stirring along with the NMMO (See paragraphs 2, 3 and 4 on page 1 of Michels). Thus, this assertion is unsupported by any cited reference. In response, applicants request an affidavit from the Examiner under the provisions of 37 CFR §1.104 (d) (2) which states:

> "[w]hen a rejection in an application is based on facts within the personal knowledge of an employee of the Office, the data shall be as specific as possible, and the reference must be supported, when called for by the applicant, by the affidavit of the employee, and such

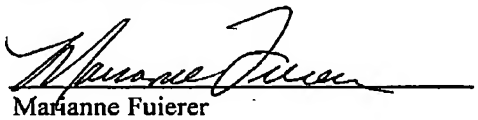
affidavit shall be subject to contradiction or explanation by the affidavits of the applicant and other persons."
(emphasis added)

Applicants therefore request that the Examiner's affidavit specifically address and support the Examiner's statement that it is "homogenizing a mixture prior to adding a component such as NMMO is known in the art," because the cited reference does not teach or suggest this aspect of applicants' claimed invention. Applicants submit that there is no *prima facie* case of obviousness, since Michels is fundamentally deficient in teaching or suggesting applicants' claimed invention.

Conclusion

Applicants have satisfied the requirements for patentability. All pending claims are free of the art and fully comply with the requirements of 35 U.S.C. §112. It therefore is requested that Examiner Purvis reconsider the patentability of all pending claims in light of the current amendment, and withdraw all rejections, thereby placing the application in condition for allowance. Notice of the same is earnestly solicited. In the event that any issues remain, Examiner Purvis is requested to contact the undersigned attorney at (919) 419-9350 to resolve same.

Respectfully submitted,



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